

CLAIMS

What is claimed is:

1. A product transfer device for use in enabling an operator to perform a product transfer operation in connection with a container, comprising:

a transfer arm having a variable length and comprising at least first and second arm sections joined together to cooperatively define a passageway, the first arm section being at least partially received within the second arm section;

a first piston seal attached to the first arm section;

a second piston seal attached to the second arm section and cooperating with the first piston seal to define a chamber, the second piston seal defining a port in communication with the chamber;

a product transfer valve in communication with the passageway;

means for automatically opening the product transfer valve;

means for automatically closing the product transfer valve; and

a shutoff valve in communication with the passageway.

2. The product transfer device as recited in claim 1, wherein the passageway is substantially leaktight when the product transfer valve and shutoff valve are closed.

3. The product transfer device as recited in claim 1, wherein a portion of the first arm section is in substantial circumferential contact with the second piston seal.

4. The product transfer device as recited in claim 1, wherein a portion of the first piston seal is in substantial circumferential contact with the second arm section.

5. The product transfer device as recited in claim 1, wherein the first piston seal is attached outside of the first arm section, and the second piston seal is attached inside the second arm section.

6. The product transfer device as recited in claim 1, wherein the port defined by the second seal is configured to be attached to a pressure source.

7. The product transfer device as recited in claim 1, wherein the first piston seal is configured and arranged for movement relative to the second piston seal.

8. The product transfer device as recited in claim 1, wherein the chamber has a volume that is variable.

9. The product transfer device as recited in claim 1, wherein the chamber is substantially leaktight when pressurized.

10. The product transfer device as recited in claim 1, wherein the means for automatically opening the product transfer valve causes the product transfer valve to open upon a predetermined extension of the transfer arm.

11. The product transfer device as recited in claim 1, wherein the means for automatically opening the product transfer valve causes the product transfer valve to close upon a predetermined retraction of the transfer arm.

12. The product transfer device as recited in claim 1, wherein the means for automatically opening the product transfer valve comprises an actuator device operably disposed with respect to the product transfer valve.

13. The product transfer device as recited in claim 1, wherein the means for automatically closing the product transfer valve comprises a securing device operably disposed with respect to the product transfer valve.

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14. A product transfer device for use in enabling an operator to perform a product transfer operation in connection with a container, comprising:

a transfer arm having a variable length and comprising at least first and second arm sections joined together to cooperatively define a passageway, the first arm section being at least partially received within the second arm section;

a first piston seal attached to the first arm section;

a second piston seal attached to the second arm section and cooperating with the first piston seal to define a chamber, the second piston seal defining a port in communication with the chamber;

a transfer valve assembly attached to the first arm section and comprising:

a body defining a fluid passageway in communication with the passageway defined by the transfer arm, and the body further defining at least one port;

a sleeve slidingly disposed about the body and configured to selectively block the at least one port;

a resilient element disposed proximate the sleeve and arranged to bias the sleeve toward a predetermined position with respect to the at least one port;

a bumper operably connected to pairs of articulated arms and being arranged for reciprocal motion relative to the at least one port, the pairs of articulated arms being configured and arranged to control motion of the sleeve based upon the position of the bumper.

15. The product transfer device as recited in claim 14, wherein when the bumper is in a first position, the sets of articulated arms retain the sleeve in position over the at least one port so that the at least one port is substantially blocked by the sleeve, and wherein when the bumper is in a second position, the sets of articulated arms are positioned such that the resilient element is able to move the sleeve into a position where at least a portion of the at least one port is unblocked.

16. The product transfer device as recited in claim 15, further comprising a resilient element positioned to bias the bumper into the first position.

17. The product transfer device as recited in claim 14, wherein a portion of the first arm section is in substantial circumferential contact with the second piston seal.

18. The product transfer device as recited in claim 14, wherein a portion of the first piston seal is in substantial circumferential contact with the second arm section.

19. The product transfer device as recited in claim 14, wherein the first piston seal is attached outside of the first arm section, and the second piston seal is attached inside the second arm section.

20. The product transfer device as recited in claim 14, wherein the port defined by the second seal is configured to be attached to a pressure source.

21. The product transfer device as recited in claim 14, wherein the first piston seal is configured and arranged for movement relative to the second piston seal.

22. The product transfer device as recited in claim 14, wherein the chamber has a volume that is variable.

23. The product transfer device as recited in claim 14, wherein the chamber is substantially leaktight when pressurized.

24. The product transfer device as recited in claim 14, further comprising a shutoff valve in communication with the passageway, the passageway being substantially leaktight when the bumper of the transfer valve assembly is in the first position, and the shutoff valve is closed.

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25. A product transfer device for use in enabling an operator to perform a product transfer operation in connection with a container, comprising:

at least first and second arm sections, each of which defines an exterior surface, the arm sections being arranged so as to cooperatively define a passageway of variable length having an upper end and a terminal end and configured for communication with a first pressure source, the passageway being substantially leaktight when pressurized the first and second arm sections cooperating with each other to define a chamber configured for communication with a second pressure source, the first arm section being configured to be at least partially received within the second arm section;

a first piston seal disposed about the first arm section so as to be at least partially received within the second arm section;

a second piston seal disposed within the second arm section so as to at least partially receive the first arm section, the second piston seal cooperating with the first piston seal to define a chamber that is substantially leaktight when pressurized, the second piston seal defining a port in communication with the chamber;

a product transfer valve in communication with the passageway;

an actuator device operably disposed with respect to the product transfer valve;

a securing device operably disposed with respect to the product transfer valve; and

a shutoff valve in communication with the passageway.

26. The product transfer device as recited in claim 25, wherein each of the piston seals comprises:

- a rider band having first and second ends;
- an upper seal member attached to the first end of the rider band;
- a lower seal member attached to the second end of the rider band;
- at least one sealing element interposed between the upper seal member and an arm section; and
- at least one sealing element interposed between the lower seal member and an arm section.

27. The product transfer device as recited in claim 25, wherein the product transfer valve comprises:

- a fitting attached to the transfer arm and defining a passageway in communication with the passageway of the transfer arm and that defines an opening;
- a door attached to the fitting and configured to selectively close off the opening defined by the fitting, the door being operatively disposed with respect to the actuator device and the securing device.

28. The product transfer device as recited in claim 25, wherein the actuator device comprises:

a resilient element mounted to the fitting;

at least one arm, the arm being rotatably mounted to the fitting and disposed proximate the resilient element;

a transfer element disposed proximate the arm; and

a bumper attached to the transfer element.

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29. A piston seal suitable for use in connection with a transfer arm having a plurality of arm sections, the piston seal comprising:

a rider band having first and second ends, the rider band being configured to be attached to one of the arm sections;

an upper seal member attached to the first end of the rider band;

a lower seal member attached to the second end of the rider band;

a first sealing element carried by the upper seal member; and

a second sealing element carried by the lower seal member.

30. The piston seal as recited in claim 29, wherein the piston seal is sized and configured to be attached within one arm section of the product transfer arm and to receive another arm section of the product transfer arm.

31. The piston seal as recited in claim 29, wherein the piston seal is sized and configured to be attached about one arm section of the product transfer arm and to be received within another arm section of the product transfer arm.

32. The piston seal as recited in claim 29, wherein the upper seal member defines a port.

33. The piston seal as recited in claim 29, wherein the upper seal member is configured to cooperate with another piston seal to at least partially define a chamber.

34. A product transfer system for use in enabling an operator to perform a product transfer operation in connection with a container, comprising:

a product transfer device, comprising:

a transfer arm having a variable length and comprising at least first and second arm sections joined together to cooperatively define a passageway, the first arm section being at least partially received within the second arm section;

a first piston seal attached to the first arm section;

a second piston seal attached to the second arm section and cooperating with the first piston seal to define a chamber, the second piston seal defining a port in communication with the chamber;

a transfer valve assembly attached to the first arm section; and

a shutoff valve in communication with the passageway; and

a pressure source configured for selective communication with at least one of: the port; and, the passageway.

35. The product transfer system as recited in claim 34, wherein a portion of the first arm section is in substantial circumferential contact with the second piston seal.

36. The product transfer system as recited in claim 34, wherein a portion of the first piston seal is in substantial circumferential contact with the second arm section.

37. The product transfer system as recited in claim 34, wherein the first piston seal is attached outside the first arm section and is configured to be received within the second arm section.

38. The product transfer system as recited in claim 34, wherein the second piston seal is attached inside the second arm section and is configured to receive a portion of the first arm section.

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